

Economics Level 1

1.2A

Demonstrate Understanding of Decisions a
Producer makes about Production



Waihi Gold Mine

Teacher Booklet

Glossary of Terms

- **Output** in economics is the "quantity of goods or services produced in a given time period
- **Goods and services** are the outcome of human efforts to meet the wants and needs of people.
- **Production** is a process of combining various material inputs and immaterial inputs (plans, know-how) in order to make something for consumption (the output).
- **Specialization** is when a nation or individual concentrates its productive efforts on producing a limited variety of goods. It often has to forgo producing other goods and relies on obtaining those other goods through trade.
- **Division of labor**, which is when cooperating individuals perform specialised tasks

Mining Terms

- **Ore**— Quartz rock that has gold and silver inside it.
- **Waste Rock**—Rock that has no or very little gold and silver making the ore not economic to extract.
- **Waste Rock embankments**— Large hills created from waste rock dug out of the open cast mine.
- **The Mill**—an area where gold and silver is taken out through a process to extract gold and silver from rock.
- **Stopes**— Areas of rock in Underground mining that are mined for ore.
- **Assayed**—testing of quartz rock for gold and silver content.

Gold Price



With a decline in the gold price over the last 4 years, mining companies are working hard on cost optimization in production.

In reducing costs, companies are able to stay competitive and return profits.

As gold is sold in US dollars, a lower exchange rate helps to reduce local costs but means overseas purchases that we import are more expensive. For us the two often cancel each other out.

THE MINING PROCESS

Name each step in mining terms and write a simple explanation in each box.

1. Find it(.....)

2. Dig it(.....)

3. Crush, cart it
(.....)

4. Treat it (Processing)

5. Deal with waste
(.....)

6. Make the water clean
(.....)

7. Make it all green again
(.....)

Competing in Price and Non-price competition

Gold mine tours

Admission

Children Under 5	Free
Children 5 to 14	\$12
Adults 15+	\$25
Family Pass	\$62
Students	\$20
Seniors 65+	\$20

GROUP DISCOUNTS AVAILABLE
BOOKINGS RECOMMENDED

CENTRE + WAIHI GOLD MINE TOUR COMBO DEAL

Children Under 5	Free
Children 5 to 14	\$22
Adults 15+	\$46
Family Pass	\$112
Students	\$38
Seniors 65+	\$38

AMBASSADOR PASS



An Ambassador Pass is a great deal if you require multiple entries throughout the year.
The pass entitles you to unlimited entry for one year, when you're accompanying an entry paying guest.
Ambassador Passes are available from the [Waihi i-SITE](#) at a special reduced rate.

Senior Pass: \$15

AdultPass: \$19

FamilyPass: \$49

Investigate further the different ways gold mine tours compete using price and non-price strategies. Location, Advertising, sponsorship, service.

Production Figures

New Underground Portal Scanner Improves Productivity

Data in tonnes for underground Truck haulage before portal scanner and after portal scanner was introduced

(Tonnes per day)	Jan	Feb	March	April	May	June
3 Trucks (Moxy 40 Tonne)	1100	1140	1100	1200	1200	1200
				Portal Scanner Introduced		

A range of other costs reduced such as diesel costs, maintenance costs, driver costs per load etc.

New Lighting Solution For Mine Pit

Before June 2014 we were unable to produce or work inside our Mine pit after 5.30pm due to lighting issues outside of daylight savings.

Our production rate of rock varied with our permit allowing us to mine until 7pm. We gained the following results. The yellow shows a new innovative lighting solution that we developed enabling us to bring light to the Mine pit working area and continue working right until out permitted time. The results are as follows.

The same labour units that were sitting around for a period or washing their truck early meant we could continue to produce right up until 7pm with much better productivity per worker. Same labour units, higher output.

7 driver units	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
2012	128500	130000	128000	124500	119000	117000	118000	112000	117000	121000	128000	122000
2013	128000	129000	124000	122000	118000	113000	117000	119000	124000	127000	130000	122000
2014	128000	129000	128000	129000	127000	128000	125000	126000	128000	126000	129000	121000

Rock Blasting Efficiencies

After gaining resource consent we for the Martha mine pit we were set a strict limit on blasting with vibration levels having to be below 5 mm/s. When filling up drilled holes with ANFO (ammonium nitrate fuel oil) we had to under charge as blast vibration is not exact science. This would often mean more down time for our loaders, truck drivers, mill etc. as our blast window was only between the hours of 10am and 3pm weekdays and 10 –12 midday on Saturday.

After developing a “funnel” loading system instead of the old “bucket” we were able to prep blasts more precisely knowing the exact amount of explosives that were being charged into drilled holes. This in turn allowed us to blast more rock while keeping within our consent conditions of vibration. The on flow of this was that more rock was able to be mined in stead of having to wait around for further blasting or a new blast window the next day.

The figures (which is recorded in tonnes of rock per month) for this can be seen below

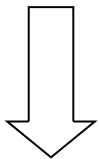
Equipment Operating	Jan	Feb	March	April	May
7 Trucks					
1 x 1900 Tonne digger					
(Bucket blast loading) 2011	124000	127000	123000	122000	118000
(Introducing of new funnel blast method) 2012	128000	123000	128000	125000	119000

A range of other efficiencies came out from this also in relation to less down time for workers, faster loading of blast zones etc.

Things that affect our ability to reach financial goals

Exchange rates, inflation, Gold and Silver rates/fluctuation, type of mining—Underground vs Open cast, consent costs, environmental costs, rehabilitation and community costs , electricity costs, grams of gold and silver per tonne

Revenue

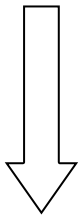


Goals

120,000 ounces of Gold

540000 ounces of Silver

Less costs



All in sustaining costs

Less than 600 US per
ounce of costs

Profit

15+ Million

Production Figures since 2012

Year	Gold	Silver
2012	67,175	281,100
2013	109,921	357,300
2014	135,032	481,921
2015 (projected)	137,500	424,000

Commercial Goals

Profit maximization-

Cost Minimisation—US 600 per ounce costs

Business expansion - investing in further resource exploration near mine and distant mine

Gold production—120,000 ounces / Silver 540000 ounces per year.

Return for investors

*Non—Commercial Goals (see next page)

Community engagement and partnerships,

Creating respect and integrity.

Valued member of host community

Consequences for society

Dust

Noise

Vibration -

Water -

Govt. Intervention—strict limits and monitoring on these areas.

Non—commercial Goals

ADVERTISEMENT

November 29, 2012

What makes a town?

JOB



It's all about jobs

Employment makes a town and a community vibrant, versatile and resilient. In the mining industry those jobs are high skill, high tech, high paying and long lasting. (Some of our staff have been here over 25 years). Over 95% of jobs at Newmont Waihi Gold are done by Kiwis. They're jobs that Waihi, and New Zealand, can't afford to lose.

400 Staff and major contractors employed by Newmont Waihi Gold

650 people in Waihi, surrounding districts and New Zealand who rely in some way on the mine for part of their income through induced employment

INVOLVEMENT



Effective communities work together and support each other

66 community groups, organisations and individuals financially supported in 2011

We live, work, and play here. It's our home too. The 2009 workforce survey recorded 172 workers or their spouses involved in a sports organisation such as soccer, rugby, motocross and tennis; 52 in service organisations like St John, Volunteer Fire Brigade and Coastguard; 93 as community volunteers in groups like Bosom Buddies; 100 in arts or cultural groups; 104 in education support in positions ranging from parent helper to Board of Trustees member; and 104 in various church groups.

OUR HOMES

Our home and the street we live on, the park or playground nearby, all of these things contribute to our quality of life and are part of what makes a community. Healthier homes and lower power bills.

Warm healthy homes mean healthy communities

209 homes insulated or ready to have insulation installed at no cost to owners in Waihi East

\$337,000

AEP payments for 2012 to date



\$200,000

available each year for the life of the Correnso project to the Community Forum to enhance Waihi East and improve property values

SCHOOLS

Schools are an important part of any community

Even if we don't have children at our local school, it remains a vital part of our community support and social infrastructure. Schools are a community hub.

\$120,000 amount paid to Waihi East educational facilities as part of Golden Link Property and Community Investment Policy

\$100,000 will be provided to six local primary schools and Waihi College as our annual partnership contribution

ENVIRONMENT



It's where we work and play

River walks, Black Hill and Pit Rim Walkways, Gilmour Lake; they're all part of the amenity value of this place we call home.

170,410

native trees and shrubs planted on site and in and around Waihi in the last five years

\$497,000

Planting and environmental projects in 2011

\$567,286

Public infrastructure such as walkways in 2011



Innovation/Technology to Improve production



April 18, 2013

In this edition...

In this edition we catch up on new technology in use underground, report on progress with the Grand Junction Refinery Building, and remind people about the unique opportunity to walk along the conveyor belt route from the open pit to the process plant as part of the ECHO Walking Festival.

SEEING THE LIGHT

Staff working underground now have new cap lamps. They battery is much lighter, and the bulbs are LEDs, which should make them more robust. The big change, however, is something you can't see.

Each cap lamp contains a microchip programmed with the underground worker's name. As each person enters or leaves the portal a scanner automatically records the event. This digital real time data is operated in tandem with the traditional tag board and provides us with an additional record of who is underground. Staff must still tag on and tag off as they always have. In the event of a power outage the physical tag board will still provide a record of who is working underground.

The electronic system does something the physical tag board cannot do.

Large underground machinery is fitted sensors that detect the microchip in the cap lamps. Each machine has a monitor that displays the immediate location of each person within an 80-100 metre radius, and their name. This means that as a truck or loader moves around the mine the driver is aware of who is close by.

Not only do the new cap lamps help the wearers 'see the light', they also let others know where they are. This technology contributes to a safer workplace.



Each new cap lamp is individually programmed with the name of its wearer.

Turning up the volume

Each underground truck can haul about 20 tonnes of ore or waste from underground to the surface. Until now it has not been possible to accurately measure how much each truck hauls out through the portal. The introduction of new technology has changed this. A Loadscan volume scanner has been installed above the portal. This gives drivers real-time feedback on the volume of their load.

Each truck has a tag that can be read by the scanner. The trucks are scanned when empty to give a tub profile, and then scanned again when they have a full load. Information on the volume and estimated tonnage of each pay load is immediately visible to the truck drivers on a display screen at the portal. Underground manager Charlie Gawith says that the system gives truck operators an immediate indication of whether they are being fully loaded underground.

'Using this system we have been able to move 10 per cent more material for the same cost. This increase in total movement in a year is a huge increase in efficiency. It means trucking costs are effectively being reduced by 10 per cent in a year and that is significant.'

New technology has increased haul truck productivity by 10%.



Walking the walk

For the last few years Newmont Waihi Gold has conducted public tours along the conveyor belt route from the open pit, under Union Hill to the

Process Plant as part of the ECHO Walking Festival. This moderate walk takes about an hour and a half and offers unique views, the chance to view mining operations close up, and a walk into history in the tunnel under Union Hill.

This walk can only be conducted on a Sunday, as this is the day that the conveyor does not operate. Participants need to wear sturdy enclosed shoes. We provide a hard hat, hi viz vest and safety glasses. The section of the walk under Union Hill is quite steep and is not recommended for very young children.

The 2013 tour is this Sunday. Last minute bookings should be made with Brian Gentil at GO Waihi, phone 863 3030.

She's looking pretty refined now



The Grand Junction refinery Building after its move.



Looking so refined: new roof, skylights and louvers.



relocation included replacing the roof and making the building weather tight. A new roof is now in place, along with a complete new set of the louvers that give the building its unique look. New window bars in the same style as the original items have been fabricated to replace those that are missing, and currently new doors are being made based on images from old photographs. You can view the results on the walkway.

You can view the results on the walkway.

Investing in our community

Over a hundred years ago gold mining was responsible for the development of the town of Waihi and the local and regional infrastructure. Roads, railway, telegraph and electric power were all provided initially to service the mining industry.

Construction of the modern Martha Mine started in 1987. Since that time we have invested a significant amount of money in the community through partnerships and sponsoring of groups, organisations and projects. We have also contributed a large amount to the local economy. For example, in the last five years we have spent over \$26m in the local community, amounting to about 32% of the town's economy.

Here are some of the projects we have supported and have been involved in over the years since mining returned to Waihi.

Waihi Streetscape 2000

We made a major financial contribution to the redevelopment of the commercial centre of town as well as funding the mine's status in front of the Memorial Hall and the replica poppet head as part of the Streetscape Project.

Replica Poppet Head

This replica headframe - used to lower and raise a cage in a vertical shaft in the historic underground mine - was constructed by Waihi Gold as a contribution to Streetscape 2000.

Waihi Community Vision and the Vision Waihi Trust

Newmont has funded these groups since their inception. This photo shows Eddie Morrow and Kevin Corney with a trophy presented to mark the group reaching the final in the community organisation section of the inaugural New Zealand of the Year Awards.



1. The Nugget multiport event
2. Bridge to Bridge riparian planting project
3. Waihi Memorial Hall refurbishment
4. Waihi's Warm Up Party for Beach Hup
5. HELP (Habitat Enhancement and Landscape Partnership)
6. Waihi (WHD about Waihi)
7. TECT helicopter
8. Community movie night (20th year gold pour)

Martha Mine Open Days

Nine events since 1984
Run in conjunction with Waihi Lure Club and with the assistance of many other community groups, open days return money to the local community to help fund local and regional projects.



Dotterel Watch Programme

Since 1995
We have funded this programme each year since 1995 in partnership with the Department of Conservation to provide a vehicle, quad bike and staff to help protect the threatened New Zealand dotterel on the Coromandel Peninsula.



Gilmour Lake

1987
Waihi Gold constructed Gilmour Lake to replace the Mine Lake, which was dewatered and removed when mining recommenced in 1987. The facility was also gifted to the community.



Waihi Events Centre

1998
Waihi Gold made a large financial contribution to the community facility, which opened in 1998.



Comish Pumphouse Relocation

2006
Newmont provided \$5 million for this project. Once relocated, the pumphouse icon became the focus of a major town revitalisation exercise. Today the pumphouse is a busy tourist attraction at the top of the town.



Waihi Gold Mining Education Trust

Since 1992
Each year Waihi Gold has provided funds for Waihi College and scholarships for individual students through an Education Trust. In the last few years we have also supported each of the primary schools in the town and immediate region.



Pit Rim Walkway

2005
The first section of the Pit Rim Walkway was constructed by Newmont in 2005. The walkway now stretches all the way around the open pit and is a popular trail for locals and visitors.

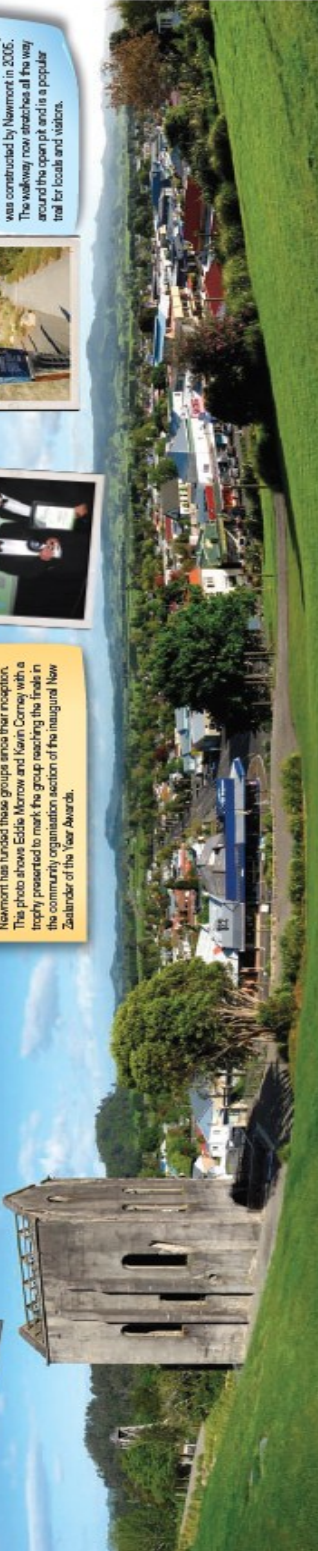


In 2011 we provided financial and/or in-kind support for the following:

- Art Walero
- Ashmore Fire Brigade - defibrillator
- Ashmore Wildlife Refuge Reserve Restoration
- Broom Buddies
- Bowdwin Boating and Sport Fishing Club
- Community Parade NZ
- Commander FM - Cancer society
- DOC - Outrigger Watch Programme
- Dylan Schmidt - transpiling representative
- Go Waihi - Beach Hop
- Go Waihi - Goldfest
- Goa Spars - surfing representative
- Hauraki Enterprises Agency
- Hetherington House - Dementia Unit
- John Mulvey - mural art
- Karangahake School
- Kaitiaki College
- Matahi Waihi 2011
- New Zealand Census
- Pierce College
- Parish of St. John Waihi
- Rachel Schmidt - transpiling representative
- Road Cushman - basketball representative
- Sport H Action - Duffin
- Sport H Action - Nugget Place
- St. James Church - Open Door Christmas Dinner
- St. Joseph's School
- Te Aroha Boxing Club
- Te Koroa Hauraki O Hauraki
- TECT Rescue Helicopter
- Thames Valley Basketball Association
- Thames Valley Bowls League
- Thames Valley Rugby Club
- The Salvation Army Christmas Food Hampers
- University of Waikato
- Vision Waihi Trust
- Waihi Hack and Hunters
- Waihi and Districts Agricultural Club
- Waihi A and P Association
- Waihi Arts Centre and Museum
- Waihi Association Football Club
- Waihi Athletic Rugby Club
- Waihi Beach Fire Brigade - defibrillator
- Waihi Beach Lifeguard Services
- Waihi Beach School
- Waihi Bowling Club
- Waihi Central School
- Waihi College
- Waihi Community Marae
- Waihi Contract Bridge Club
- Waihi Darts Association
- Waihi East School
- Waihi Fire Brigade
- Waihi Golf Club
- Waihi Harp Society
- Waihi Heritage Vision
- Waihi Indoor Bowling Club
- Waihi Line Hockey
- Waihi Performing Arts
- Waihi Punket Society
- Waihi Special Needs Idol Day
- Waihi Tennis Club
- Waihi Timebank
- Waihi Toy Library
- Waihi School
- Waimata School
- White Ribbon campaign
- Woodstock NZ Patrons

For further information about Newmont Waihi Gold's community investment programme please visit www.waighold.co.nz (community section).

The Newmont Waihi Gold community engagement line is attended 24 hours a day, seven days a week.
0800 NEWMONT (0800 639 6688) www.waighold.co.nz www.newmont.com



Innovation/Technology to Improve production

A range of technology is used to improve safety/efficiency and cost during the production cycle.

In improving production The Waihi gold mining company uses

Cyanide which replaced Mercury. Mercury has a recovery of around 60% with Cyanide having a recovery rate of up to 90%

Proximity Devices—These have allowed machinery to travel faster as safety is improved and peoples location are beamed into individual vehicles. Faster transportation, less diesel consumed along with higher safety and reduced production costs.

Load scanner— helping to ensure trucks are filled to capacity reducing the amount of loads needed, better fuel efficiency and less trips, higher production per load.

Crusher and Conveyor belts—enabling more rock to be moved more safely and efficiently in a cost effective way 2.8kms out of town to reduce effect on community. Time efficient, cost efficient with less community impact.

Macro Economics

Our current underground mine operation is called “Correnso”. This has been given approval recently through the RMA which is a Govt. process.

The following is a snap shot of what Corresno is projected to offer Waihi in relation to Macro Economics.

This document is a general summary of a detailed technical report. A full understanding can only be gained by reading

What effect will Correnso have on the economy of Waihi and the region?

- The majority of expected economic impact (74%) is expected to be felt within the district (31%) or the region (43%). Some 74% (\$877 million) is likely to be felt through spending and employment (some 500 direct and mine-related jobs) in these two areas.
- The direct impact of Correnso and any future mining within the Golden Link Project Area is likely to be substantial with an annual average operating spend of some \$81 million (including a payroll of some \$13.1 million) and some 266 direct Full Time Equivalent (FTE) positions associated with the operation.
- Any extensions to Correnso or similar future projects would be expected to generate direct expenditure of approximately \$100 million per year of additional mine life, which in turn will generate output and value added economic benefits of around \$300 million and \$200 million per year respectively along with some 650 or more direct and mine-related FTE positions.
- The level of purchasing outside of New Zealand is 9%. This is relatively low compared to associated industries or many other industries found in New Zealand’s import dependent economy. Relative to previous projects such as Martha and Favona.
- Annual tax payments to central government of some \$8.2 million are anticipated.
- Newmont Waihi Gold paid some \$490,000 in local authority rates and \$35,000 in regional rates in 2011. It is expected that similar payments will be made over the life of Correnso (and any future extension of underground workings within the Golden Link Project Area).
- The presence of a ratepayer such as Newmont Waihi Gold allows a scale and scope of activity to be provided by local authorities which would otherwise not be possible.
- NWG has in the past made significant donations to the local community consistently amounting to sums in excess of \$400,000 per year. The effect of Correnso is to continue the annual contribution in donations.